Forensic soil analysis is very important to criminal investigation because identifying the source of case samples can provide physical evidence supporting the guilt or innocence of possible suspects. Forensic science requires careful validation of new techniques and procedures to analyze the evidence collected at crimes scenes. This research compares several methods of soil sample preparation and analysis by gas chromatography (GC-FID), density gradient, and oxidation–reduction potential (ORP). Multiple soil samples from specific research sites in West-Central Illinois are tested and data are compared to see which method works best.